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04/03/2007

Guru Subramanyam

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DAYTON, OH 45402-2023

EXAMINER

DICKEY, THOMAS L

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/575,754	Applicant(s) SUBRAMANYAM ET AL.	
	Examiner Thomas L. Dickey	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 43-75 is/are pending in the application.
- 4a) Of the above claim(s) 55-58 and 61-75 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 43-54, 59 and 60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :
7/17/06; 1/16/07; 5/07/08; 8/27/08; 2/02/09.

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DETAILED ACTION

1. The preliminary amendment filed on 04/13/2006 has been entered.

Election/Restriction

2. Applicant's election without traverse of Invention II, species 1 (claims 43-54, 59, and 60) in the reply filed on 2/13/09 is acknowledged.

Oath/Declaration

3. The oath/declaration filed on 04/03/2007 is acceptable.

Drawings

4. The formal drawings filed on 04/13/2006 are acceptable.

Priority

5. Acknowledgement is made of applicant's claim for domestic priority under 35 U.S.C. 119(e), through provisional application 60/512,631 filed 10/20/2003.

Information Disclosure Statement

6. The Information Disclosure Statements filed on 7/17/06; 1/16/07; 5/07/08; 8/27/08; and 2/02/09 have been considered.

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Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 43-54, 59, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over KUYLENSTIERNA ET AL. ("Tuneable Electromagnetic Bandgap Structures based on Ba_{0.25}Sr_{0.75}TiO₃ Parallel-plate Varactors on Silicon Coplanar Waveguides", 33rd European Microwave Conference, 2003) in view of Satoh et al. (5,576,564). In the examiner's opinion, this/these claim(s) would have been obvious according to one of the rationales expressed in the *Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.*, as published at 72 Federal Register 57526 et seq.¹ (10/10/2007).

The Guidelines explain that an invention that would have been obvious to a person of ordinary skill at the time of the invention is not patentable. The Guidelines point out that, as reiterated by the Supreme Court in KSR, the framework for the objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere*

¹ Available at <http://www.uspto.gov/web/offices/com/sol/notices/72fr57526.pdf> See also MPEP, Eighth Ed. Rev. 6 (Sept. 2007) §§ 2141 et seq., available at

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Co. Obviousness is a question of law based on underlying factual inquiries. The factual inquiries enunciated by the Court are as follows:

- (1) Determining the scope and content of the prior art;
- (2) Ascertaining the differences between the claimed invention and the prior art, and
- (3) Resolving the level of ordinary skill in the pertinent art.

Examining this last factor first, it is noted that any obviousness rejection should include, either explicitly or implicitly in view of the prior art applied, an indication of the level of ordinary skill. This is an essential finding because (as the Guidelines point out) a finding as to the level of ordinary skill may be used as a partial basis for a resolution of the issue of obviousness. The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art include:

- (1) "Type of problems encountered in the art;"
- (2) "prior art solutions to those problems;"
- (3) "rapidity with which innovations are made;"
- (4) "sophistication of the technology;" and
- (5) "educational level of active workers in the field."

In a given case, every factor may not be present, and one or more factors may predominate. In the present case, Applicant has presented claims to a device classi-

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fied in Class 257 (Semiconductor Devices). Considering the five enumerated factors in order, it is noted that:

- 1) The types of problems encountered in Class 257 typically are highly complex, involving questions of electrodynamics, thermodynamics, crystallography, and quantum mechanics.
- 2) Prior art solutions to the problems presented in this field demonstrate thinking of the highest order. Many prior art solutions in this field have won Nobel prizes. Over a half century or more, the Nobel Prize Committee has recognized² the extraordinary nature (and high value, both commercially and in terms of quality of life) of prior art solutions to complex problems in this field made by individuals such as John Bardeen, William Shockley, Jack Kilby, Leo Esaki, Nick Basow, Zhores Alferov, Pierre-Gilles de Gennes, Herbert Kroemer, and perhaps a few more this writer has overlooked. Note, for example, that the most recent Nobel Prize in physics went to Albert Fert and Peter Grünberg for an innovative solution to the problem of Giant Magnetic Resonance, a solution now incorporated into many semiconductor memory devices.
- 3) Innovations in Class 257 are made with extremely high rapidity (see, e.g. "Moore's Law").
- 4) Technology used to make and practice inventions in this field are highly so-

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phisticated. Some “fabs” (as those of skill in the art call the factories for making these devices) now cost in excess of six billion dollars each³, and perform literally hundreds of billions of operations per hour.

5) Finally, the educational level of active workers in this field is extremely high – Ph.D.s are common, and a bachelor’s degree in engineering is the absolute minimum educational level of workers in this field.

In short, the level of ordinary skill in this field is extremely high. In *KSR* (while considering an invention involving the substitution of one simple mechanical linkage for another), the Supreme Court cautioned, “A person of ordinary skill is also a person of ordinary creativity”. *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1742, 82 USPQ2d 1385, 1397 (2007). Had the Court been looking at 1) the scientific complexity of problems encountered in the semiconductor arts, 2) the variety of extraordinarily valuable (from lifestyle-changing, such as high-speed communications and computing, to handy devices such as iPods and cellphones) and difficult solutions to challenging problems that have been accomplished in the semiconductor art in recent years, 3) the extreme rapidity of advances in this art, 4) the highly sophisticated “fabs” used to build semiconductor devices, and 5) the high educational level of persons practicing this art, the Court

² For example, see “Presentation Speech, 2000 Nobel Prize,
http://nobelprize.org/nobel_prizes/physics/laureates/2000/presentation-speech.html

³ See, e.g., “Trying to Put New Zip Into Moore’s Law”, New York Times, 2/24/2008
(http://www.nytimes.com/2008/02/24/business/24proto.html?_r=1&oref=slogin)

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might easily have said that in the semiconductor art the person of ordinary skill is a person of extraordinary creativity.

Next, we consider the first and second factual findings required by *Graham*. The scope and content of the prior art includes, in the Kuylenstierna et al. disclosure, a description of a varactor shunt switch for microwave applications, the varactor shunt switch comprising: a high resistivity silicon layer having a resistivity greater than 1 k Ω -cm and a thickness of about 0.051 cms; a 200 nm thick silicon oxide layer on said high resistivity silicon layer; a 500 nm thick metallic layer, comprising a 400 nm thick gold layer on said silicon oxide layer and a 100 nm thick platinum layer on said gold layer, on said silicon oxide layer; a tunable ferroelectric thin-film dielectric layer on said metallic layer, wherein said tunable ferroelectric thin-film dielectric layer has a dielectric constant of greater or equal to about 200 at zero bias, an optimized dielectric constant of 1200, and a thickness of greater than 250 nm; and a top metal electrode on said tunable ferroelectric thin-film dielectric layer, wherein said top metal electrode defines a coplanar waveguide transmission line. Note figure 1 and pages 1111 (column 2) through 1112 (column 1) of Kuylenstierna et al.

The applicants' claims 53, 54, 59, and 60 do not distinguish over the Kuylenstierna et al. reference regardless of the process used to form the metallic layer, because only the final product is relevant, not the recited processes of depositing and lifting off said metallic layer by RF sputtering, pulsed layer deposition, or electron beam deposition

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and standard lift-off photolithography. See *SmithKline Beecham Corp. v. Apotex Corp.*, 78 USPQ2d 1097 (Fed. Cir, 2006 (“While the process set forth in the product-by-process claim may be new, that novelty can only be captured by obtaining a process claim.”))

Note that when “product by process” claiming is used to describe one or more limitations of a claimed product, the limitations so described are limitations of the claimed product per se, no matter how said product is actually made. In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a “product by process” claim and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in “product by process” claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. See also MPEP 706.03(e).

The Federal Circuit recently revisited the question of whether a “product by process” claim can be anticipated by a reference that does not recite said process. See *Smith-Kline Beecham Corp. v. Apotex Corp.*, 78 USPQ2d at 1100. The Federal Circuit cited with approval this Office’s current statement of the law, found in MPEP § 2113:

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[Even] though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.

Id. at 1101. The Federal Circuit held this statement to be consistent with its own views on this topic, as well as various Supreme Court rulings, notably *Gen. Elec. Co. v. Wabash Appliance Corp.*, 304 U.S. 364, 373 (1938) (“Although in some instances a claim may validly describe a new product with some reference to the method of production, a patentee who does not distinguish his product from what is old except by reference, express or constructive, to the process by which he produced it, cannot secure a monopoly on the product by whatever means produced.”). *Id.*

Once the examiner produces a *prima facie* case, the burden shifts to the applicant, “to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product”. *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985), quoting *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594,596 (CCPA 1980). See also *In re Best*, 562 F.2d 1252,1255, 195 USPQ 430,433-34 (CCPA 1977), and *In re Brown*, 59 CCPA 1036, 1041, 459 F.2d 531, 535, 173 USPQ 685, 688 (1972), where the court explains the reasoning behind this rule: “[W]hen the prior art discloses a product which reasonably appears to be either identical with or only slightly different than a product claimed in a product-by-process claim, a rejection based alternatively on either section 102 or section 103 of the statute is eminently fair and acceptable. As a practical matter, the Patent Office is not equipped to manufacture products by the myriad of processes

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put before it and then obtain prior art products and make physical comparisons there-with" (emphasis added).

The difference between the prior art and the claimed device is that the claim requires a combination of Kuylenstierna et al.'s varactor shunt switch with a 20 nm thick titanium adhesion layer formed between the silicon oxide layer and the metallic layer.

However, Satoh et al. discloses a varactor with a 20 nm thick titanium adhesion layer 3 formed between a silicon oxide layer 2 and a metallic layer 4. Note figure 1 and column 4 lines 42-50 of Satoh et al. The question is, taking into account the high level of education, skill, and creativity of one of ordinary skill in the semiconductor art, would it have been obvious to combine Satoh et al.'s 20 nm thick titanium adhesion layer with Kuylenstierna et al.'s varactor shunt switch?

To reject a claim based on the basis of the rationale expressed in section IIIA of the *Examination Guidelines*, Office personnel first must resolve the Graham factual inquiries (as has just been done). Office personnel must then articulate the following:

- (1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;
- (2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely would have performed the same function as it did separately;
- (3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and
- (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

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As explained above, Kuylenstierna et al. discloses a device (varactor shunt switch) which differed from the claimed device by the absence of some components (a 20 nm thick titanium adhesion layer formed between the silicon oxide layer and the metallic layer). Because Satoh et al. discloses the missing components, the only difference between the claimed invention and the prior art is the lack of actual combination of varactor shunt switch and a 20 nm thick titanium adhesion layer formed between the silicon oxide layer and the metallic layer in a single prior art reference. Further, Satoh et al. discloses that those of skill in the art were familiar with a method of combining a 20 nm thick titanium adhesion layer formed between a silicon oxide layer and a metallic layer with a ferroelectric varactor very similar to Kuylenstierna et al.'s varactor shunt switch. From the similarities between Satoh et al.'s ferroelectric varactor and Kuylenstierna et al.'s varactor shunt switch, one of skill in the art would have been able to conclude that Satoh et al.'s 20 nm thick titanium adhesion layer could have been combined with the disclosed elements of Kuylenstierna et al.'s varactor shunt switch. One of skill in the art would have had reason to predict (based on its functioning in combination with Satoh et al.'s ferroelectric varactor) that the 20 nm thick titanium adhesion layer, formed between the silicon oxide layer and the metallic layer of Kuylenstierna et al.'s varactor shunt switch, would have continued functioning much as it did while formed between the silicon oxide layer and the metallic layer of Satoh et al.'s ferroelectric varactor, and that when substituted, Kuylenstierna et al.'s varactor shunt switch would continue function-

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ing in the manner disclosed by Kuylenstierna et al. It would therefore have been obvious to a person having skill in the art to combine the 20 nm thick titanium adhesion layer taught by Satoh et al. with Kuylenstierna et al.'s varactor shunt switch.

Claims 43-48, 52-54, 59, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over SATOH ET AL. (5,576,564) in view of Mueller et al. (6,097,263). In the examiner's opinion, this/these claim(s) would have been obvious according to the rationale expressed in section IIIA of the *Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.*, as published at 72 Federal Register 57526 et seq. (10/10/2007).

In the context of the extraordinarily high skill in the art (as discussed above), we consider the first and second factual findings required by *Graham*. The scope and content of the prior art includes, in the Satoh et al. disclosure, a description of a varactor comprising a high resistivity silicon layer (1), having a thickness of about 0.051 cms and a resistivity greater than 1 k Ω -cm; a 200 nm thick silicon oxide layer (2) on said high resistivity silicon layer (1); a 20 nm thick titanium adhesion layer (3) on said silicon oxide layer (2); a 500 nm thick metallic layer (4) on said silicon oxide layer (2); a tunable ferroelectric thin-film dielectric layer (6) on said metallic layer (4), wherein said tunable ferroelectric thin-film dielectric layer (6) has a thickness of greater than 250 nm; and a

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top metal electrode (7) on said tunable ferroelectric thin-film dielectric layer (6). Note figure 1 and column 4 lines 42-50 of Satoh et al.

The applicants' claims 53, 54, 59, and 60 do not distinguish over the Satoh et al. reference regardless of the process used to form the metallic layer, because only the final product is relevant, not the recited processes of depositing and lifting off said metallic layer by RF sputtering, pulsed layer deposition, or electron beam deposition and standard lift-off photolithography. See *SmithKline Beecham Corp. v. Apotex Corp.*, 78 USPQ2d 1097 (Fed. Cir, 2006 ("While the process set forth in the product-by-process claim may be new, that novelty can only be captured by obtaining a process claim."))

Note that when "product by process" claiming is used to describe one or more limitations of a claimed product, the limitations so described are limitations of the claimed product per se, no matter how said product is actually made. In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that

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applicant has the burden of proof in such cases, as the above caselaw makes clear.

See also MPEP 706.03(e).

The Federal Circuit recently revisited the question of whether a “product by process” claim can be anticipated by a reference that does not recite said process. See *Smith-Kline Beecham Corp. v. Apotex Corp.*, 78 USPQ2d at 1100. The Federal Circuit cited with approval this Office’s current statement of the law, found in MPEP § 2113:

[Even] though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.

Id. at 1101. The Federal Circuit held this statement to be consistent with its own views on this topic, as well as various Supreme Court rulings, notably *Gen. Elec. Co. v. Wabash Appliance Corp.*, 304 U.S. 364, 373 (1938) (“Although in some instances a claim may validly describe a new product with some reference to the method of production, a patentee who does not distinguish his product from what is old except by reference, express or constructive, to the process by which he produced it, cannot secure a monopoly on the product by whatever means produced.”). *Id.*

Once the examiner produces a *prima facie* case, the burden shifts to the applicant, “to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product.” *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985), quoting *In re Fitzgerald*, 619 F.2d 67,70, 205 USPQ 594,596 (CCPA 1980). See also *In re Best*, 562 F.2d 1252,1255, 195 USPQ 430,433-34 (CCPA 1977), and *In re Brown*, 59

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CCPA 1036, 1041, 459 F.2d 531, 535, 173 USPQ 685, 688 (1972), where the court explains the reasoning behind this rule: “[W]hen the prior art discloses a product which reasonably appears to be either identical with or only slightly different than a product claimed in a product-by-process claim, a rejection based alternatively on either section 102 or section 103 of the statute is eminently fair and acceptable. As a practical matter, the Patent Office is not equipped to manufacture products by the myriad of processes put before it and then obtain prior art products and make physical comparisons there-with” (emphasis added).

The applicant’s claims 43-48, 52-54, 59, and 60 do not distinguish over the Satoh et al. reference regardless of the claims reciting the performing of certain function(s) using the claimed device, because only the device per se is relevant, not the recited functions of biasing the tunable ferroelectric thin-film dielectric layer to zero bias while producing a dielectric constant of greater or equal to about 200 and biasing the tunable ferroelectric thin-film dielectric layer while optimizing the dielectric constant to 1200.

Note that functional language in a device claim is directed to the device per se, no matter which of the device’s functions is referred to in the claim. *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (“[A]pparatus claims cover what a device *is*, not what a device *does*” [emphasis in original]); *In re King*, 231 USPQ 136 (Fed. Cir, 1986) (“It did not suffice merely to assert that [the cited prior art] does not inherently achieve [the claimed function], challenging the

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PTO to prove the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks"); *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977) (claiming a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable); *Ex parte Smith*, 83 USPQ2d 1509, 1514 (Bd. Pat. App. & Int. 2007, PRECEDENTIAL) ("Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product"); *Ex parte THOMAS J. WHALEN II*, slip opinion⁴, page 13, (BPAI, PRECEDENTIAL, decided July 23, 2008) ("[T]he examiner must provide some evidence or scientific reasoning to establish the reasonableness of the examiner's belief that the functional limitation is an inherent characteristic of the prior art' before the burden is shifted to the applicant to disprove the inherency"); and *Leggett & Platt Inc. v. VUTEk Inc.*, 537 F3d 1349, 1352, 87 USPQ2d 1947, 1951 (Fed. Cir. 2008) ("Moreover, because the claim is written with functional rather than structural language—it requires the cold UV assembly to be 'effective to' substantially cure rather than requiring ink to be substantially cured—the claim limitation will be anticipated so long as the LEDs disclosed in the '823 patent are able to cure the ink to a great extent"). See MPEP § 2114.

⁴ Available at the BPAI website as <http://www.uspto.gov/web/offices/dcom/bpai/prec/fd074423.pdf>

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In this case, it is reasonable to predict that Satoh et al.'s device is capable of biasing the tunable ferroelectric thin-film dielectric layer to zero bias while producing a dielectric constant of greater or equal to about 200 and biasing the tunable ferroelectric thin-film dielectric layer while optimizing the dielectric constant to 1200, because a comparison of Applicant's specification to Satoh et al.'s disclosure reveals that Satoh et al. discloses a device that is apparently identical to the device Applicant describes as being capable of performing the function(s) of biasing the tunable ferroelectric thin-film dielectric layer to zero bias while producing a dielectric constant of greater or equal to about 200 and biasing the tunable ferroelectric thin-film dielectric layer while optimizing the dielectric constant to 1200.

Because it is reasonable to predict that assume that Satoh et al.'s device is capable of performing the claimed function, the burden shifts to Applicants to come forward with evidence showing that the prior art device, despite reasonable appearances, is not so capable. See MPEP § 2114.

The difference between the prior art and the claimed device is that the claim requires a combination of Satoh et al.'s varactor with a top metal electrode defining a coplanar waveguide transmission line to produce a varactor shunt switch for microwave applications.

However, Mueller et al. discloses a varactor including a top metal electrode 358 (or 362) defining a coplanar waveguide transmission line to produce a varactor shunt

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switch for microwave applications. Note figure 12, column 9 lines 47-67, and column 10 lines 1-28 of Mueller et al. The question is, taking into account the high level of education, skill, and creativity of one of ordinary skill in the semiconductor art, would it have been obvious to combine Satoh et al.'s varactor with Mueller et al.'s top metal electrode defining a coplanar waveguide transmission line to produce a varactor shunt switch for microwave applications?

To reject a claim based on the basis of the rationale expressed in section IIIA of the *Examination Guidelines*, Office personnel first must resolve the Graham factual inquiries (as has just been done). Office personnel must then articulate the following:

- (1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;
- (2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely would have performed the same function as it did separately;
- (3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and
- (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

As explained above, Satoh et al. discloses a device (varactor) which differed from the claimed device by the absence of some components (a top metal electrode defining a coplanar waveguide transmission line to produce a varactor shunt switch for microwave applications). Because Mueller et al. discloses the missing components, the only difference between the claimed invention and the prior art is the lack of actual combination of varactor and a top metal electrode defining a coplanar waveguide transmission

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line to produce a varactor shunt switch for microwave applications in a single prior art reference. Further, Mueller et al. discloses that those of skill in the art were familiar with a method of using a top metal electrode defining a coplanar waveguide transmission line to produce a varactor shunt switch for microwave applications, said varactor shunt switch being very similar to Satoh et al.'s varactor. From the similarities between Mueller et al.'s varactor shunt switch and Satoh et al.'s varactor, one of skill in the art would have been able to conclude that the disclosed elements of Satoh et al.'s varactor could have combined with a top metal electrode defining a coplanar waveguide transmission line to produce a varactor shunt switch for microwave applications. One of skill in the art would have had reason to predict (based on its functioning in combination with Mueller et al.'s varactor shunt switch) that, in combination with Satoh et al.'s varactor, a top metal electrode defining a coplanar waveguide transmission line would have continued functioning much as it did in combination with Mueller et al.'s varactor shunt switch, and that when substituted, Satoh et al.'s varactor would continue functioning in the manner disclosed by Satoh et al. It would therefore have been obvious to a person having skill in the art to combine the top metal electrode defining a coplanar waveguide transmission line taught by Mueller et al. with Satoh et al.'s varactor to produce a varactor shunt switch for microwave applications.

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Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L. Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, please contact the examiner's supervisor, Sue A. Purvis, at 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

***/Thomas L. Dickey/
Primary Examiner
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